

### Argument #1.

## Less Chronic Disease and Better Overall Health

---



### Our Diet Is Killing Us

At least one of every six deaths in the United States—upwards of 340,000 each year—is linked to a poor diet and sedentary lifestyle.<sup>1</sup> The average American is about as likely to die from a disease related to diet and physical inactivity as from smoking tobacco—and far likelier to die from diet and inactivity than from an automobile accident, homicide, or infectious disease such as pneumonia.<sup>2</sup> Among nonsmokers, the combination of diet and physical inactivity is the *single* largest cause of death.

The specific diet-related diseases that fell so many of us include heart disease, certain cancers, stroke, and diabetes. Those and other chronic diseases (so called because they develop

- The saturated fat and cholesterol in beef, pork, dairy foods, poultry, and eggs cause about 63,000 fatal heart attacks annually.
- Less than a quarter of all adults eat the recommended number of daily servings of fruits and vegetables—foods that reduce the risk of heart disease and cancer.
- Vegetarians enjoy lower levels of blood cholesterol, less obesity, less hypertension, and fewer other problems than people whose diet includes meat.

and progress over many years) are caused in part by diets too poor in healthy plant-based foods and too rich in unhealthy animal-based foods.

### We Eat Too Much of What's Bad for Us...

Obesity, which is directly linked to diet and a sedentary lifestyle, markedly increases a person's risk of heart disease, hypertension (high blood pressure), diabetes, and some cancers. Rates of obesity have doubled in children and adults and tripled in teenagers since the late 1970s, which is not surprising, since—thanks to ubiquitous high-calorie foods—the average adult eats 100 to 500 calories more per day and—thanks to modern conveniences—exercises less.<sup>3</sup> The additional calories have come mainly from the least healthy foods: white flour, added fats and oils, and refined sugars.<sup>4</sup>

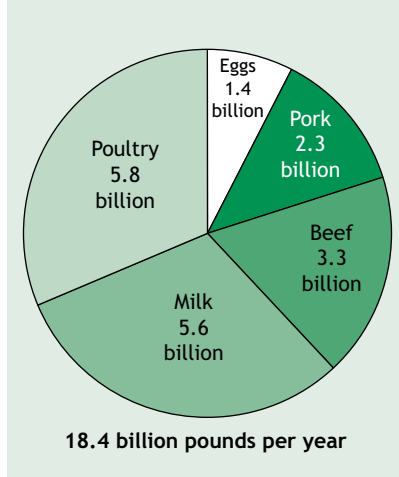


Moreover, Americans are eating more flesh foods—beef, pork, chicken, turkey, and seafood. In 2003, for instance, Americans ate more of each of those foods than they did a half-century earlier (see figure 1 and table 1). Fortunately, the biggest increase was for poultry, which is not directly linked to chronic disease. However, a lot of that chicken—and fish too—is not baked or grilled, but deep fried in partially hydrogenated oil. That oil contains trans fat, one of the most potent

causes of heart disease. Meanwhile, Americans cut their consumption of beef by 30 percent since 1976; that is likely due both to health concerns and lower chicken prices.

Our inconsistent efforts to eat healthy diets extend to non-meat foods as well. Although we are eating one-third fewer eggs—the yolks of which are our biggest source of cholesterol and thus contribute to heart disease—than we did in 1953, we are eating four times as much cheese—which is high in saturated fat and promotes heart disease (see table 1).

**Figure 1. Major sources of animal protein produced in the United States<sup>5</sup>**



**Table 1. Per capita availability of major sources of meat, poultry, and seafood; dairy foods; and eggs<sup>6</sup>**

Year	Beef & veal	Pork	Chicken	Turkey	Fish & shellfish	Milk & yogurt	Cheese	Eggs
1909	56	41	10	1	10*	34	4	293
1953	61	39	15	4	11	37	7	379
1976	92	41	29	7	13	30	16	270
2003	62	49	58	14	16	23	31	253

Notes: Figures for meat, poultry, and seafood represent the numbers of trimmed (edible) pounds per capita that were available in the food supply; the remaining figures represent the per capita numbers of gallons (milk and yogurt), pounds (cheese), or eggs that were available in the food supply. Due to waste and spoilage, actual consumption is lower. Beef consumption peaked in 1976.

\*Figure is for 1929, the first year for which data are available.

Looking at other non-animal-derived portions of our diet, we are consuming massive amounts of nutritionally poor plant-based foods, notably:

- refined grains (white bread, white pasta, and white rice), which are stripped of much of their nutrients and dietary fiber;
- soft drinks and other foods high in refined sugars (including high-fructose corn syrup), which replace more healthful foods and promote obesity; and
- baked goods and fried foods made with partially hydrogenated vegetable oil and palm, palm kernel, and coconut oils, which promote heart disease.

Finally, there's salt. The large amounts of salt in most packaged and restaurant foods and processed meats increase blood pressure, which increases the risk of heart attacks and strokes.

### ...And Not Enough Whole Grains, Fruits, and Vegetables

The U.S. Department of Agriculture (USDA) estimates that the average adult eats only one serving of whole grains daily.<sup>7</sup> In contrast, the *Dietary Guidelines for Americans* recommends that at least half of our 6 to 10 daily grain servings should be whole grain.<sup>18</sup> The



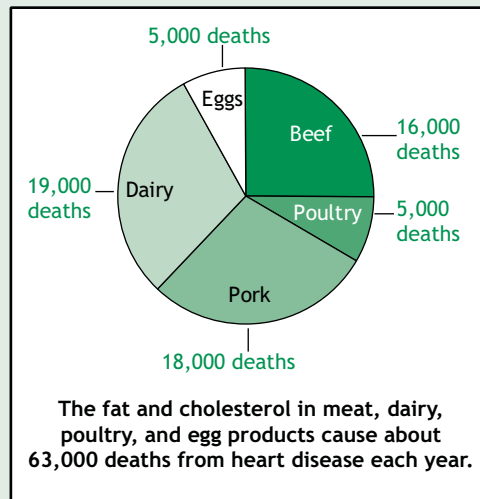
### The Cardiovascular Benefit of Eating Less Meat and Dairy

Probably the biggest health benefit from eating less animal products (other than fish) is a lower risk of heart disease. The Center for Science in the Public Interest estimated the approximate benefit based on the:

- amounts of different fatty acids and cholesterol that are supplied by various animal products,
- impact of saturated fat and cholesterol on blood cholesterol levels, and
- relationship between blood cholesterol and heart disease.

We first estimated how our consumption of fats and cholesterol would change if all the beef, pork, milk and cheese, poultry, and eggs were removed from the average diet and either not replaced or replaced with foods that did not affect the risk of heart disease.<sup>8</sup> Next, we projected how those changes in fat and cholesterol intake would affect blood cholesterol levels by averaging the results from formulas developed by several leading researchers.<sup>9</sup> We then assumed that a 1 percent increase in blood cholesterol—total or low-density lipoprotein (LDL, or “bad” cholesterol) increases heart disease mortality by 2 percent.<sup>10</sup>

Those calculations indicate that avoiding animal fats would save about 63,000 lives per year (see figure).<sup>11</sup> Because that estimate is based on inexact assumptions, the true total might easily be 25,000 more or fewer lives per year. The number of lives saved would be dramatically greater if one assumed that people replaced much of the meat and dairy products with healthier plant-based foods or fish. The economic benefit of avoiding the fat would be about \$100 billion a year or in excess of \$1 trillion over 20 years.<sup>12</sup> On the other hand, the same methodology indicates that the healthy unsaturated fats in salad oils currently save about 7,000 lives a year.



Of course, we could reap some of those benefits by switching to lower-fat animal products—such as from beef to chicken or even buffalo and to low-fat dairy foods.

### The Economic Benefits of a More Plant-Based Diet

Diseases related to a diet too poor in plant foods and too rich in animal foods contribute to skyrocketing health-care costs. The annual cost of angioplasties and coronary bypass operations is about \$50 billion, with statin heart-disease drugs adding \$15 billion.<sup>13</sup> Spending to treat high blood pressure (including \$15 billion for drugs<sup>14</sup>), stroke, diabetes (another \$7 billion for drugs), and cancer add additional billions.<sup>15</sup> And, of course, on top of the medical costs are the incalculable amounts of pain and suffering (of both the people with the diseases and their friends and relatives) and lost productivity.

Eating a more plant-based diet wouldn't eliminate all those costs, but would certainly move us well along in the right direction. One study estimated that going vegetarian would save the nation \$39 billion to \$84 billion annually.<sup>16</sup> If obesity—which is much less common in vegetarians than others—were eliminated, we could save about \$73 billion a year.<sup>17</sup>

USDA also estimates that we are eating 1.2 servings of fruit and 3.7 servings of vegetables per day, considerably less than the recommended 5 to 10 daily servings.<sup>19</sup> And, disappointingly, potato chips and French fries (which are often cooked in partially hydrogenated shortening) here count as “vegetables.” Indeed, one-third of the vegetables that we eat are iceberg lettuce and potatoes, two of the least nutritious. We are consuming only one-third the recommended amount of the most nutritious vegetables: deep yellow and dark leafy green vegetables, and beans.<sup>20</sup>

According to the USDA, we're very slowly increasing our consumption of vegetables: Fresh vegetables are up 33 percent, and total vegetables are up 25 percent, since 1970. Surprisingly, though, fruit consumption is up only 12 percent over that period and has not increased at all in 20 years.<sup>21</sup>

As our diets have been buffeted by cultural, economic, and other factors, the evidence that certain dietary changes can reduce our risk of chronic disease has become much stronger. Much of the research shows that people who eat more plant-based diets, such as those traditionally eaten in Mediterranean or Asian countries, are generally healthier than those eating the typical American, Canadian, or northern European diet.

### How Do We Know?

Study after study points to meat and dairy products, especially fatty ones, as causes of chronic diseases. The harm results both from specific constituents in animal products (such as saturated fat and cholesterol) and from pushing healthier nutrient-rich plant foods out of the diet. This section

presents the science behind the (by now) commonly accepted premise that eating too many of the wrong animal products and too few of the healthiest plant foods does tremendous harm to our health. Again, a common-sense caveat: Modest amounts of fatty fish and low-fat dairy, meat, and poultry products—even an occasional hot dog or cheeseburger—certainly can fit into a healthy diet. The problems arise from immoderation.

One approach to understanding the influence of diet on health is to compare groups of people who eat very different diets. Such “observational” studies can provide important insights into what constitutes a health-promoting diet, though they cannot determine with certainty the particular elements in the diets—or other aspects of the subjects’ lives—that are responsible for the better health. We review those studies first, then examine “intervention” studies, which are better able to identify causes and effects. Finally, we examine the health effects of specific foods and nutrients.

### Observational Studies Show That Vegetarians Live Longer and Are Less Prone to Chronic Diseases

Studies that compare disease patterns in people with different kinds of diets help identify factors that cause or prevent diseases. For example, dif-

ferences in disease rates between vegetarians (or vegans, who abstain from all animal products, including dairy and eggs) and non-vegetarians can help identify the effects of meat and other animal products. The weakness of this “observational” approach is that factors other than diet—such as physical activity, air pollution, use of legal and illegal drugs, and cigarette smoking—affect dis-



*Meatless meals offer an incredible variety of tastes, textures, and smells.*

ease rates as well. Scientists try to account for those kinds of factors, but it is impossible to know about and account for everything.

### *Seventh-day Adventists Eat a More Plant-Based Diet and Live Longer and Healthier Lives*

Seventh-day Adventists (SDAs), whose religion advocates abstinence from meat and poultry as well as alcohol and tobacco, have provided invaluable evidence on lifestyle and health.<sup>22</sup> About half of American SDAs follow a vegetarian diet or eat meat less than once a week. About one-quarter of SDAs follow a meatless lacto-ovo vegetarian diet, which includes dairy products and eggs, and about 3 percent are vegan. Generally, even non-vegetarian SDAs eat less meat than does the average American. Vegetarian or not, SDAs also tend to be physically active and eschew tobacco and alcohol. So, by comparing vegetarian and non-vegetarian SDAs and adjusting for factors such as smoking, physical activity, and alcohol, the effects of a vegetarian diet can be teased out. Vegetarian SDAs may also be compared to the general population to shed light on the health effects of a lacto-ovo vegetarian diet.

SDAs, on average, consume less saturated fat and cholesterol and more dietary fiber than the average American.<sup>23</sup> They eat more fruit, green salads, whole wheat bread, and margarine and less meat, cream, coffee, butter, and white bread. The same is true of vegetarian SDAs compared to non-vegetarian SDAs.<sup>24</sup>

Key findings from studies of SDAs include the following:

- *Longevity.* Vegetarian SDA women live 2.5 years longer than non-vegetarian SDA women; vegetarian SDA men live 3.2 years longer than their non-vegetarian counterparts.<sup>25</sup>
- *Heart attacks.* Non-vegetarian SDA men have twice the rate of fatal heart attacks as vegetarian SDA men.<sup>26</sup> Similarly, the risk of fatal heart disease is more than twice as high for men who eat beef more than three times a week as for vegetarians.<sup>27</sup> However, beef consumption or vegetarianism does not clearly affect the risk of heart disease in women.<sup>28</sup>
- *Stroke.* SDAs in the Netherlands have about a 45 percent lower death rate from strokes than the total Dutch population.<sup>29</sup>
- *Cholesterol.* Among African American SDAs, LDL (“bad”) cholesterol and triglycerides (the most common fat found in blood) were lower in vegans than in lacto-ovo vegetarians.<sup>30</sup> Both of those fatty substances promote heart attacks.
- *Hypertension.* Hypertension, which increases the risk of heart attacks and strokes, is twice as common in non-vegetarian SDAs as in vegetarians; semi-vegetarians (those who eat fish and poultry less than once a week) had intermediate rates.<sup>31</sup> Those findings apply to both men and women. When hypertension was defined as “taking antihypertensive



medication” (those with more severe hypertension), non-vegetarians had almost three times the rate of hypertension as vegetarians.<sup>32</sup>

- *Diabetes.* Diabetes is twice as common in non-vegetarian SDAs, whether male or female, as in vegetarians, with semi-vegetarians having an intermediate prevalence.<sup>33</sup>
- *Cancer.* Prostate cancer is 54 percent, and colon cancer is 88 percent, more common in non-vegetarian than in vegetarian SDAs.<sup>34</sup>

Some of those health benefits may be due not to particular nutrients in plant foods, but to the fact that bulky plant-based diets help reduce body weight. For example, for the average 5'10" male SDA, non-vegetarians weigh an average of 14 pounds more than vegetarians. For 5'4" female SDAs, non-vegetarians weigh 12 pounds more than vegetarians.<sup>35</sup>

#### *Vegetarians Have Less Heart Disease, Hypertension, and Diabetes*

Studies of non-SDA vegetarians yield similar results. For example, the USDA's 1994–95 Continuing Survey of Food Intake by Individuals asked more than 13,000 people whether they considered themselves to be vegetarian.<sup>36</sup> Self-defined vegetarians whose diets did not include meat made up 0.9 percent of this nationally representative sample. Compared to non-vegetarians, the self-defined vegetarians tended to consume less fat, saturated fat, and cholesterol and more fiber. Self-defined vegetarians also ate more grains, legumes, vegetables, and fruit. In addition, they consumed fewer calories and had lower BMIs (body mass index, which combines height and weight) than non-vegetarians.<sup>37</sup>

Several large studies in Europe have examined the health of vegetarians. The European Prospective Investigation into Cancer and Nutrition (EPIC) is an ongoing study involving over 500,000 people in 10 countries. The part of that study being conducted in the United Kingdom (EPIC-Oxford) involves more than 34,000 non-vegetarians and close to 33,000 non-meat-eaters (including people who eat fish, lacto-ovo vegetarians, and vegans).<sup>38</sup> Another British study, the Oxford Vegetarian Study, compared 6,000 vegetarians to 5,000 non-vegetarians.<sup>39</sup> (More than half of the non-vegetarian subjects in that study did not eat meat daily and, therefore, were not typical of the general British population.) Findings from those studies and similar ones include the following:

- *Cholesterol.* Vegans have 28 percent lower LDL cholesterol levels than meat-eaters. Lacto-ovo vegetarians and fish-eaters have levels between those of vegans and meat-eaters.<sup>40</sup> Based on blood cholesterol levels, the researchers estimated that heart disease rates would be 24 percent lower



in lifelong vegetarians and 57 percent lower in lifelong vegans than in meat-eaters.

- *Heart disease.* Vegetarians have a 28 percent lower death rate from heart disease than meat-eaters.<sup>41</sup>
- *Blood pressure.* Vegetarians have lower blood pressure and a lower rate of hypertension than non-vegetarians. Vegans have the lowest blood pressure and the least hypertension, followed by vegetarians and fish-eaters; non-vegetarians have the highest rates of hypertension.<sup>42</sup> (Differences in body weight were responsible for about half of the variation in blood pressure; alcohol consumption and vigorous exercise accounted for some of the variation in men.<sup>43</sup>) The EPIC-Oxford study found hypertension rates of 9 percent in lacto-ovo vegetarians and 13 percent in non-vegetarians.<sup>44</sup>
- *Diabetes.* Mortality from diabetes is markedly lower for vegetarians (and for health-conscious non-vegetarians) than for the general population.<sup>45</sup>

As with the SDAs, some of the European vegetarians' health advantages are likely due to lower rates of obesity.<sup>46</sup> For instance, in the Oxford Vegetarian Study, overweight or obesity ( $\text{BMI} \geq 25$ ) was twice as common in non-vegetarian men, and 1½ times more common in non-vegetarian women, as in vegetarians.<sup>47</sup> In a Swedish study of middle-aged women, the risk of obesity was 65 percent lower in vegans, 46 percent lower in lacto-vegetarians (those who avoid meat, fish, poultry, and eggs), and 48 percent lower in semi-vegetarians compared to non-vegetarians.<sup>48</sup> On average, vegetarians are leaner than their non-vegetarian counterparts by about 1 BMI unit

### Meta-Analysis Find Vegetarians Have Less Heart Disease

Meta-analysis is a powerful statistical technique that combines the results from a number of similar studies into a single, large analysis. If done properly, such an analysis can provide more conclusive results than any single study. A meta-analysis of five studies (the Adventist Mortality Study, Health Food Shoppers Study, Adventist Health Study, Heidelberg Study, and Oxford Vegetarian Study) included a total of 76,172 vegetarians (both lacto-ovo vegetarians and vegans) and non-vegetarians with similar lifestyles.<sup>49</sup> The vegetarians had a 24 percent lower rate of fatal heart attacks than non-vegetarians. When compared to people who ate meat at least weekly, mortality from heart disease was 20 percent lower in occasional meat-eaters, 34 percent lower in those who ate fish but not meat, 34 percent lower in lacto-ovo vegetarians, and 26 percent lower in vegans. (The data on vegans may not be reliable, because the meta-analysis included only 753 vegans.) The meta-analysis did not find any difference in death rates from stroke or cancer between the vegetarians and non-vegetarians.

(roughly 6 pounds).<sup>50</sup> Differences in rates of obesity and BMI may be due to vegetarians' higher intake of fiber and lower intake of animal fat, although other unknown factors also appear to be involved.<sup>51</sup>

In sum, several large studies have found that vegetarians enjoy lower risks of major chronic diseases and longer lives than non-vegetarians. That is not surprising, considering that vegetarians have lower rates of obesity, lower saturated fat and cholesterol intakes, higher fiber intakes, and lower total and LDL cholesterol levels. Vegetarians' somewhat greater physical activity also plays a role. Smoking clearly is an important risk factor, but most recent studies adjust for it, as well as for age, alcohol use, and other readily identified factors. It is always possible, of course, that vegetarians may differ from other people in ways not accounted for in the studies.

Though the numbers of vegans in the studies are small, they tend to have lower serum total and LDL cholesterol, less hypertension, and a lower prevalence of obesity than lacto-ovo vegetarians. However, there is no evidence that vegans live longer than lacto-ovo vegetarians and semi-vegetarians.<sup>52</sup>

#### *Followers of a "Prudent" Diet Are Less Likely to Have Heart Disease*

Other major studies have found important connections between dietary patterns and heart disease. The ongoing Nurses' Health Study, which is managed by the Harvard School of Public Health, compared a "prudent" diet, with higher intakes of fruits, vegetables, legumes, whole grains, fish, and poultry, to the "Western" pattern, which is high in red and processed (sausage, bacon, and the like) meats, sweets, desserts, fried foods, and refined grains. After 12 years, among the more than 69,000 participants, the women who ate prudent diets were 36 percent less likely to develop heart disease than those who ate typical Western diets.<sup>53</sup> In a similar study of almost 45,000 male health professionals, a prudent diet was associated with about a 30 percent lower risk of developing heart disease or of dying from a heart attack.<sup>54</sup>

#### **Intervention Studies Demonstrate Benefits of Low-Fat Vegetarian Diets**

The bottom line from observational studies is that diets based more on plant foods—and that means carrots, not carrot cake—pay big health dividends. But the limitation of those studies is that vegetarians and other health-conscious individuals might be doing things besides eating more plant foods and fewer animal products that are the real reasons for their better health. Intervention studies overcome that limitation.

The best way to study the effect of diet on chronic disease is to assign participants randomly to two or more different diets. Such "intervention"

studies include those in which subjects were placed on vegetarian or other kinds of diets, thus allowing researchers to evaluate the diets' relative strengths and weaknesses.

*Low-Fat Vegetarian Diets Can Lower Blood Pressure and Decrease the Risk of Heart Disease*

Vegetarian diets have proven to be remarkably beneficial for people who have cardiovascular disease. For instance, switching from ordinary omnivorous diets to a lacto-ovo vegetarian diet with similar sodium content but more fiber, calcium, and potassium reduced the blood pressure in subjects who had either normal or high blood pressure.<sup>55</sup> Differences in the kinds of fat, as well as the levels of minerals, in the vegetarian and non-vegetarian diets may have accounted for some of the differences in blood pressure.<sup>56</sup>

Several recent intervention studies examined the effect of a near-vegan diet high in phytosterols and soluble fiber on blood cholesterol levels.<sup>57</sup> Phytosterols are plant-based substances with a chemical structure related to cholesterol; they are added to some margarines, yogurts, and orange juice to reduce cholesterol absorption. The soluble fiber in such foods as oats, barley, psyllium, eggplant, and okra forms thick, sticky solutions that increase the excretion from the body of bile acids and lower blood cholesterol levels.

David Jenkins and colleagues at the University of Toronto placed people with high blood cholesterol levels on either (1) a near-vegan diet high in phytosterols, soluble fiber, and soy protein; (2) a low-saturated-fat lacto-ovo vegetarian diet; or (3) the latter diet along with a cholesterol-lowering statin drug. The diet that included phytosterols, soluble fiber, and soy protein improved cholesterol levels just as much as the lacto-ovo vegetarian diet plus the statin. Judging from the subjects' changes in cholesterol levels, blood pressure, and other measures, the near-vegan diet led to a 32 percent lower risk of heart disease than the lacto-ovo vegetarian diet. The near-vegan diet presumably had a greater effect because of the soluble fiber, phytosterols, and possibly soy protein (but see "Soy Foods: No Health Miracle," on p. 39). Jenkins notes, "There is hope



*Morale-boosting communal dinners likely contribute to the success of the CHIP heart-health program (see next page).*

that these diets may provide a non-pharmacologic treatment option for selected individuals at increased risk of cardiovascular disease.<sup>58</sup>

Based in part on the Toronto studies, the National Cholesterol Education Program, a part of the National Heart, Lung, and Blood Institute, recommended a combination of statins and dietary modifications for patients with high LDL cholesterol levels (above 130 milligrams per deciliter).<sup>59</sup>

Hans Diehl, a health educator at the Lifestyle Medical Institute in Loma Linda, California, has developed a community-based Coronary Health Improvement Project (CHIP) that involves hundreds of people at a time. CHIP encourages participants to switch to a near-vegan, low-fat diet (though most participants make more modest changes) and engage in walking or other physical activities.<sup>63</sup> After only a few weeks on the

### The DASH and Mediterranean Diets

The Dietary Approaches to Stop Hypertension (DASH) intervention study used a more plant-based, but not vegetarian, diet. DASH examined the effects of a diet that includes twice the average daily consumption of fruits, vegetables, and low-fat dairy products; one-third the usual intake of red meat; half the typical use of fats, oils, and salad dressings; and one-quarter the typical number of unhealthy snacks and sweets. It emphasizes whole grains and severely limits salt (see “Changing Your Own Diet,” p. 143, for more about this diet). Compared to a typical American diet, the DASH diet lowers blood cholesterol, blood pressure, and the risk of cardiovascular disease.<sup>60</sup> A major strength of this study was that the subjects were given all their meals, so the researchers knew exactly what they were eating.

A prominent French study, the Lyon Diet Heart Study, tested the effect on heart disease of a Mediterranean-type diet that emphasizes fruits, vegetables, bread and other grains, potatoes, beans, nuts, seeds, and olive oil and contains only modest amounts of animal products. In subjects who had already had a heart attack, the Mediterranean diet led to 50 to 70 percent fewer deaths, strokes, and other complications compared to those following a “prudent” Western-type diet.<sup>61</sup> Interestingly, blood cholesterol levels and cigarette use were similar in the two groups, indicating that other factors—possibly the threefold higher level of alpha-linolenic acid, an omega-3 fatty acid, in the experimental group—play important health roles. Also, weight loss was not responsible for the dramatic benefit—a finding unlike those in some other studies. Harvard Medical School professor Alexander Leaf commented that this “well-conducted” study showed that “relatively simple dietary changes achieved greater reductions in risk of all-cause and coronary heart disease mortality in a secondary prevention trial than any of the cholesterol-lowering [drug] studies to date.”<sup>62</sup> He also noted that the subjects readily adhered to this diet.

program, participants typically eat more fruits and vegetables and less saturated fat and cholesterol than a control group. In one study, compared to the controls, the participants' average LDL cholesterol level declined by 14 percent.<sup>64</sup> Subjects who changed their diets also lost an average of 7½ pounds, and their rate of hypertension dropped in half. The CHIP study shows that a health-promotion program can provide enormous benefits to large groups of people in a cost-effective way.

### *Diet and Exercise Can Reverse Heart Disease*

Dean Ornish, of the University of California in San Francisco, and his colleagues have done ground-breaking studies in patients with moderate to severe heart disease. The researchers prescribe a very-low-fat vegetarian diet (containing no animal products except nonfat dairy products and egg whites), along with moderate aerobic exercise, smoking cessation, and stress reduction. That regimen significantly improved cholesterol levels, at least temporarily. It also began unclogging arteries and preventing angina (the chest pain that occurs when the heart muscle does not get enough blood) and heart attacks.<sup>65</sup> Lipid-lowering statin drugs were not needed. The lifestyle changes were as effective as coronary bypass surgery in reducing angina. The subjects who ate the low-fat vegetarian diet and made other lifestyle changes lost an average of 24 pounds, which was undoubtedly an important factor in their improved health.

In another study by Ornish's research group, 440 men and women with coronary artery disease ate the same largely vegetarian diet and made the prescribed lifestyle changes.<sup>66</sup> After one year, the subjects enjoyed reduced blood lipids (13 percent lower LDL cholesterol in men, 16 percent lower in women), blood pressure (1 to 2 percent reduction in systolic blood pressure), and weight (5 percent in men, 7 percent in women).

### **Fighting Prostate Cancer with Lifestyle**

Prostate cancer, which kills 30,000 American men each year, may be controlled with lifestyle changes, including a low-fat vegan diet. Dean Ornish and his colleagues at the University of California "treated" with diet, fish oil and other supplements, exercise, and other lifestyle changes half of a group of 93 volunteers with early prostate cancer. The other half received the usual care. After one year, prostate-specific antigen, one index of prostate cancer, decreased 4 percent in the treatment group but increased 6 percent in the control group. The cancer progressed sufficiently in six men in the control group, but in none in the experimental group, to warrant conventional medical therapy.<sup>67</sup>



*Decades of eating fatty meat and dairy products can turn healthy arteries (like the opened and flattened human aorta at left) into ones afflicted with severe atherosclerosis (right).*

In a smaller but much longer study, Caldwell Esselstyn of the Cleveland Clinic monitored 18 patients with severe coronary artery disease.<sup>68</sup> Most of them had suffered coronary problems after a previous bypass surgery or angioplasty. All of those who ate an almost entirely plant-

based diet had no recurrence of coronary events over 12 years (a few patients took low doses of statin drugs some of the time). One patient who “fell off the wagon” had a heart attack and then resumed the program. The coronary arteries of 70 percent of the patients studied became less clogged. In Dr. Esselstyn’s words, his patients had become “virtually heart-attack proof.”

One concern about diets high in carbohydrates is that they tend to raise triglycerides and lower high-density lipoprotein (HDL, or “good” cholesterol), a prescription for heart disease. However, in China and Japan, where traditional diets are very high in carbohydrates, heart disease is almost nonexistent. That’s probably because most Chinese and Japanese people have been lean and active—very different from the typical American. In addition, studies by Dean Ornish and David Jenkins of North Americans are reassuring. They found that diets high in carbohydrates from whole grains and beans, but low in white flour and sugar, led to major reductions in LDL cholesterol but had little or no effect on triglycerides and HDL cholesterol. The fact that Ornish’s subjects were moderately active and lost weight undoubtedly helped. Ornish speculates that even when high-carbohydrate diets lower HDL cholesterol, that does not increase the risk of heart disease, while the low HDL cholesterol levels seen in people whose diets are high in refined sugars and starches do promote heart disease.<sup>69</sup>

### ***A More Plant-Based Diet Can Treat Type 2 Diabetes***

Low-fat vegetarian diets can treat type 2 diabetes, a terrible and increasingly common disease that causes everything from blindness to gangrene (and amputations) to heart disease. In one 26-day study of 652 people with diabetes, more than one-third of the insulin-using subjects who adopted a low-fat vegetarian diet were able to discontinue the insulin. Close to three-quarters of those on the vegetarian diet who were taking oral hypoglycemic



medicines were able to stop taking them.<sup>70</sup> The vegetarian diet also yielded a 22 percent reduction in serum cholesterol and a 33 percent reduction in triglycerides. Some of those benefits were likely due to the subjects' losing an average of 8 pounds.

A study that combined a low-fat, high-fiber vegan diet with daily exercise and weight loss (11 pounds in 25 days) was also highly successful in treating type 2 diabetes.<sup>71</sup> The lifestyle changes eliminated the pain related to diabetes-caused nerve damage in most of the subjects. It also reduced fasting blood glucose levels, blood pressure, and the need for medications.

The results of intervention studies strongly indicate that a largely plant-based diet provides tremendous benefits—sometimes even as great as those achieved by powerful prescription drugs or surgery. Though some of those studies also involved relaxation, exercise, or low levels of drugs, diets consisting mostly of nutritious plant-based foods clearly are extremely effective at preventing or treating chronic diseases. The benefits include reductions in blood pressure, total and LDL cholesterol, blood glucose, clogging of arteries, and—most importantly—less cardiovascular disease and type 2 diabetes.

Building on that body of research, leading health agencies in the United States and abroad have developed quite similar dietary advice (see table 2). They stress the benefits from beans, whole grains, fruits, vegetables, and seafood, along with physical activity, and the harm that is associated with fatty meat and dairy products.

### What Specific Foods Should We Be Eating—and Avoiding?

The studies we have discussed compared the health effects of widely different *diets*. Researchers also have studied the health benefits and risks of specific *food groups*, such as fruits and vegetables, and meat.

#### Fruits and Vegetables

Americans are eating slightly more fruits and vegetables today than the paltry amounts we ate 35 years ago, but still far less than the recommended 5 to 10 servings per day. Fruits and





39. An uncooked grass-fed rib steak contains about 13 milligrams of eicosapentanoic acid (EPA) and 2 milligrams of docosahexaenoic acid (DHA) per 3½ ounces. It also contains about 33 milligrams of alpha-linolenic acid per serving, which provides the body with no more than 8 milligrams of EPA and DHA. Thus, a 7-ounce uncooked rib steak could provide, at most, about 46 milligrams of EPA and DHA. Certain other cuts have twice as much omega-3s. J.D. Wood, M. Enser, A.V. Fisher, et al., "Animal nutrition and metabolism group symposium on improving meat production for future needs," *Proc Nutr Soc* (1999) 58:363–70.
40. Cleveland Clinic, *The Power of Fish* (Cleveland, 2003), [www.clevelandclinic.org/heartcenter/pub/guide/prevention/nutrition/omega3.htm](http://www.clevelandclinic.org/heartcenter/pub/guide/prevention/nutrition/omega3.htm).
41. USDA, Economic Research Service, "Briefing room: land use, value, and management: major uses of land" (2002), [www.ers.usda.gov/Briefing/LandUse/majorlandusechapter.htm](http://www.ers.usda.gov/Briefing/LandUse/majorlandusechapter.htm), accessed Dec. 27, 2005.
42. U.S. Environmental Protection Agency (EPA), *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–1998*, EPA 236-R-00-001 (2000), [http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BMQ76/\\$File/2000-inventory.pdf](http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BMQ76/$File/2000-inventory.pdf), p. K-8.
43. American Society of Agricultural Engineers, *Manure Production and Characteristics* (St. Joseph, MI, 2002), pp. 687–89.
44. K. Richardson and P.A. McKay, "On the farm, chickens come home to roost," *Wall Street Journal* Aug. 12, 2005:C1.

### Argument #1. Less Chronic Disease and Better Overall Health (pp. 17-57)

1. J.M. McGinnis and W.H. Foege, "The immediate vs the important," *JAMA* (2004) 291:1263–64. Their estimated range for 2000 was 340,000 to 642,000 deaths per year, or 16 to 30 percent of all deaths.
2. M.M. Miniño, E. Arias, K.D. Kochanek, et al., "Deaths: final data for 2000," *Natl Vital Stat Rep* (2002) 50(15):1–120.
3. *Morbidity and Mortality Weekly*, "Trends in intake of energy and macronutrients: United States, 1971–2000," *MMWR* (2004) 53:80–82; and J. Putnam, J. Allshouse, and L.S. Kantor, "U.S. per capita food supply trends: more calories, refined carbohydrates, and fats," *FoodReview* (2002) 25(3):2–15.
4. U.S. Department of Agriculture, Office of Communications (USDA OC), *Agriculture Fact Book 2001–2002* (2003), [www.usda.gov/factbook/chapter2.htm](http://www.usda.gov/factbook/chapter2.htm).
5. USDA, National Agricultural Statistics Service (USDA NASS), *Milk Production, Disposition, and Income 2002 Summary* (Washington, DC, 2003), p. 2; USDA NASS, *Poultry Slaughter 2002 Annual Summary* (Washington, DC, 2003), p. 2; USDA NASS, *Livestock Slaughter 2002 Summary* (Washington, DC, 2003), pp. 35, 41, 49; USDA NASS, *Chickens and Eggs 2003 Summary* (Washington, DC, 2004), p. 2; and USDA, Economic Research Service (USDA ERS), Food Availability database, [www.ers.usda.gov/Data/FoodConsumption/FoodAvailQueryable.aspx#midForm](http://www.ers.usda.gov/Data/FoodConsumption/FoodAvailQueryable.aspx#midForm).
6. USDA ERS, *Food Availability (Per Capita)* (2005), [www.ers.usda.gov/data/foodconsumption/FoodAvailIndex.htm](http://www.ers.usda.gov/data/foodconsumption/FoodAvailIndex.htm).
7. USDA OC, *Agriculture Fact Book*.
8. P.A. Cotton, A.F. Subar, J.E. Friday, et al., "Dietary sources of nutrients among US adults, 1994 to 1996," *J Am Diet Assoc* (2004) 104:921–30. Food consumption data from USDA Agricultural Research Service (USDA ARS), Food Surveys Research Group, Continuing Survey of Food Intakes by Individuals 1994–1996, [www.barc.usda.gov/bhnrc/foodsurvey/home.htm](http://www.barc.usda.gov/bhnrc/foodsurvey/home.htm).

9. A. Keys, J.T. Anderson, and F. Grande, "Serum cholesterol response to changes in the diet. IV. Particular saturated fatty acids in the diet," *Metabolism* (1965) 65:776–87; D.M. Hegsted, L.M. Ausman, J.A. Johnson, et al., "Dietary fat and serum lipids: an evaluation of the experimental data," *Am J Clin Nutr* (1993) 57:875–83; R.P. Mensink and M.B. Katan, "Effect of dietary fatty acids on serum lipids and lipoproteins: a meta-analysis of 27 trials," *Arterioscler Thromb* (1992) 12:911–19; and P.M. Kris-Etherton, A.E. Binkoski, G. Zhao, et al., "Dietary fat: assessing the evidence in support of a moderate-fat diet; the benchmark based on lipoprotein metabolism," *Proc Nutr Soc* (2002) 61(2):287–98.
10. J.E. Manson, H. Tosteson, P.M. Ridker, et al., "The primary prevention of myocardial infarction," *N Engl J Med* (1992) 326:1406–16.
11. M. Jacobson and H. D'Angelo, "Heart disease deaths caused by animal foods," unpublished report (Washington, DC: Center for Science in the Public Interest [CSPI], 2006). Estimates based on the four different research groups' formulas ranged from 30,000 to 107,000 deaths per year.
12. The \$1 trillion sum is the present value discounted at 3 percent. It is based on the U.S. Food and Drug Administration's (FDA's) estimate of the health and economic benefits of lowering dietary levels of trans fat, which have adverse effects on blood cholesterol levels and cause heart disease. See FDA, "Nutrition labeling," *Fed Reg* (1999) 64:62746–825.
13. American Heart Association (AHA), *Heart Disease and Stroke Statistics: 2005 Update* (Dallas, 2005), p. 51; and L.S. Longwell, communications department, IMS Health, Inc., response to CSPI data request, Oct. 25, 2004.
14. Longwell, response.
15. American Cancer Society, *Cancer Facts and Figures, 2004* (Atlanta, 2004); AHA, *Heart Disease and Stroke*; American Diabetes Association, "Economic costs of diabetes in the U.S. in 2002," *Diabetes Care* (2003) 26:917–32; and E. Frazão, *America's Eating Habits: Changes and Consequences*, Agriculture Information Bulletin No. 750 (1999), [www.ers.usda.gov/publications/aib750/aib750a.pdf](http://www.ers.usda.gov/publications/aib750/aib750a.pdf).
16. N.D. Barnard, A. Nicholson, and J.L. Howard, "The medical costs attributable to meat consumption," *Prev Med* (1995) 24:646–55 (adjusted to 2005 dollars by CSPI).
17. A.M. Wolf and G.A. Colditz, "Social and economic effects of body weight in the United States," *Am J Clin Nutr* (1996) 63(suppl):466S–69S (adjusted to 2005 dollars by CSPI); and E.A. Finkelstein, I.C. Fiebelkorn, and G. Wang, "State-level estimates of annual medical expenditures attributable to obesity," *Obes Res* (2004) 12:18–24.
18. U.S. Department of Health and Human Services and U.S. Department of Agriculture (DHHS/USDA), *Dietary Guidelines for Americans* (2005), [www.health.gov/dietaryguidelines/dga2005/document/pdf/DGA2005](http://www.health.gov/dietaryguidelines/dga2005/document/pdf/DGA2005).
19. USDA ERS, *Data: Food Guide Pyramid Servings* (2005), [www.ers.usda.gov/data/foodconsumption/FoodGuideIndex.htm#servings](http://www.ers.usda.gov/data/foodconsumption/FoodGuideIndex.htm#servings).
20. J.F. Guthrie, *Understanding Fruit and Vegetable Choices: Economic and Behavioral Influences*, Agriculture Information Bulletin 792-1, [www.ers.usda.gov/publications/aib792/aib792-1/aib792-1.pdf](http://www.ers.usda.gov/publications/aib792/aib792-1/aib792-1.pdf).
21. USDA ERS, *Food Availability*.
22. G.E. Fraser, *Diet, Life Expectancy, and Chronic Disease: Studies of Seventh-day Adventists and Other Vegetarians* (New York: Oxford, 2003), p. 5; G.E. Fraser, "Associations between diet and cancer, ischemic heart disease, and all-cause mortality in non-Hispanic white California Seventh-day Adventists," *Am J Clin Nutr* (1999) 70(suppl):532S–38S; G.E. Fraser, P.W. Dysinger, C. Best, et al., "IHD risk factors in middle-aged Seventh-day Adventist men and their neighbors," *Am J Epidemiol* (1987) 126:638–46.
23. Fraser, Dysinger, Best, et al., "IHD risk factors."
24. Fraser, *Diet*, p. 13.

25. Fraser, "Associations."
26. Fraser, "Associations."
27. G.E. Fraser, J. Sabate, W.L. Beeson, et al., "A possible protective effect of nut consumption on risk of coronary heart disease: the Adventist Health Study," *Arch Intern Med* (1992) 152:1416–24.
28. Fraser, "Associations."
29. J. Berkel and F. de Waard, "Mortality pattern and life expectancy of Seventh-day Adventists in the Netherlands," *Int J Epidemiol* (1983) 12(4):455–59, cited in Fraser, *Diet*, p. 23.
30. M.L. Toohey, M.A. Haris, D. Williams, et al., "Cardiovascular disease risk factors are lower in African-American vegans compared to lacto-ovo vegetarians," *J Am Coll Nutr* (1998) 17:425–34.
31. Fraser, "Associations."
32. Fraser, *Diet*, pp. 141–42.
33. N. Brathwaite, H.S. Fraser, N. Modeste, et al., "Obesity, diabetes, hypertension, and vegetarian status among Seventh-day Adventists in Barbados: preliminary results," *Ethn Dis* (2003) 13:34–9; and Fraser, "Associations."
34. Fraser, "Associations."
35. Fraser, "Associations."
36. E.H. Haddad and J.S. Tanzman, "What do vegetarians in the United States eat?," *Am J Clin Nutr* (2003) 78(suppl):626S–32S.
37. E.T. Kennedy, S.A. Bowman, I.T. Spence, et al., "Popular diets: correlation to health, nutrition, and obesity," *J Am Diet Assoc* (2001) 101:411–20.
38. G.K. Davey, E.A. Spencer, P.N. Appleby, et al., "EPIC-Oxford lifestyle characteristics and nutrient intakes in a cohort of 33,993 meat-eaters and 31,546 non-meat-eaters in the UK," *Public Health Nutr* (2003) 6:259–69.
39. P.N. Appleby, M. Thorogood, J.I. Mann, et al., "The Oxford Vegetarian Study: an overview," *Am J Clin Nutr* (1999) 70(suppl):525S–31S.
40. Appleby et al., "Oxford Vegetarian Study."
41. Appleby et al., "Oxford Vegetarian Study."
42. Appleby et al., "Oxford Vegetarian Study"; and Fraser, *Diet*, pp. 233–35.
43. P.N. Appleby, G.K. Davey, and T.J. Key, "Hypertension and blood pressure among meat eaters, fish eaters, vegetarians and vegans in EPIC-Oxford," *Public Health Nutr* (2002) 5:645–54.
44. Appleby, Davey, and Key, "Hypertension."
45. Fraser, *Diet*, p. 220.
46. T. Key and G. Davey, "Prevalence of obesity is low in people who do not eat meat," *BMJ* (1996) 313:816–17.
47. P.N. Appleby, M. Thorogood, and J.I. Mann, "Low body mass index in non-meat eaters: the possible roles of animal fat, dietary fibre and alcohol," *Int J Obesity* (1998) 22(5):454–60.
48. P.K. Newby, K.L. Tucker, and A. Wolk, "Risk of overweight and obesity among semivegetarian, lactovegetarian, and vegan women," *Am J Clin Nutr* (2005) 81:1267–74.
49. T.J. Key, G.E. Fraser, M. Thorogood, et al., "Mortality in vegetarians and non-vegetarians: detailed findings from a collaborative analysis of 5 prospective studies," *Am J Clin Nutr* (1999) 70(suppl):516S–24S.
50. T.J. Key, G.K. Davey, and P.N. Appleby, "Health benefits of a vegetarian diet," *Proc Nutr Soc* (1999) 58(2):271–75.

51. Appleby, Thorogood, and Mann, "Low body mass index"; and Key, Davey, and Appleby, "Health benefits."
52. Fraser, *Diet*, pp. 236–38.
53. T.T. Fung, W.C. Willett, M.J. Stampfer, et al., "Dietary patterns and the risk of coronary heart disease in women," *Arch Intern Med* (2001) 161:1857–62.
54. F.B. Hu, E.B. Rimm, M.J. Stampfer, et al., "Prospective study of major dietary patterns and risk of coronary heart disease in men," *Am J Clin Nutr* (2000) 72:912–21.
55. I.L. Rouse, L.J. Beilin, D.P. Mahoney, et al., "Nutrient intake, blood pressure, serum and urinary prostaglandins and serum thromboxane B2 in a controlled trial with a lacto-ovo-vegetarian diet," *J Hypertens* (1986) 4:241–50; and S.E. Sciarrone, M.T. Strahan, L.J. Beilin, et al., "Biochemical and neurohormonal responses to the introduction of a lacto-ovo vegetarian diet," *J Hypertens* (1993) 11:849–60.
56. Rouse et al., "Nutrient intake"; and L.J. Appel, T.J. Moore, E. Obarzanek, et al., "A clinical trial of the effects of dietary patterns on blood pressure," *N Engl J Med* (1997) 336:1117–24.
57. A.M. Lees, A.Y. Mok, R.S. Lees, et al., "Plant sterols as cholesterol-lowering agents: clinical trials in patients with hypercholesterolemia and studies of sterol balance," *Atherosclerosis* (1977) 28:325–38; and D.J. Jenkins, T.M. Wolever, A.V. Rao, et al., "Effect on blood lipids of very high intakes of fiber in diets low in saturated fat and cholesterol," *N Engl J Med* (1993) 329:21–6.
58. D.J. Jenkins, C.W. Kendall, A. Marchie, et al., "Effects of a dietary portfolio of cholesterol-lowering foods vs lovastatin on serum lipids and C-reactive protein," *JAMA* (2003) 290:502–10; D.J. Jenkins, C.W. Kendall, A. Marchie, et al., "Direct comparison of a dietary portfolio of cholesterol-lowering foods with a statin in hypercholesterolemic participants," *Am J Clin Nutr* (2005) 81(2):380–87; and D.J. Jenkins, C.W. Kendall, A. Marchie, et al., "The effect of combining plant sterols, soy protein, viscous fibers, and almonds in treating hypercholesterolemia," *Metabolism* (2003) 52(11):1478–83.
59. S.M. Grundy, J.I. Cleeman, B.C.N. Merz, et al., "Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III Guidelines," *Circulation* (2004) 110:227–39.
60. D.W. Harsha, P.-H. Lin, E. Obarzanek, et al., "Dietary Approaches to Stop Hypertension: a summary of results," *J Am Diet Assoc* (1999) 99(suppl):S53–59; N.M. Karanja, E. Obarzanek, P.-H. Lin, et al., "Descriptive characteristics of the dietary patterns used in the Dietary Approaches to Stop Hypertension trial," *J Am Diet Assoc* (1999) 99(suppl):S19–S27; F.M. Sacks, L.P. Svetkey, W.M. Vollmer, et al., "Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet," *N Engl J Med* (2001) 344:3–10; Appel et al., "A clinical trial"; and E. Obarzanek, F.M. Sacks, and W.M. Vollmer, "Effects on blood lipids of a blood pressure-lowering diet: the Dietary Approaches to Stop Hypertension (DASH) trial," *Am J Clin Nutr* (2001) 74(1):80–89.
61. M. deLorgeril, P. Salen, J.-L. Martin, et al., "Mediterranean diet, traditional risk factors, and the rate of cardiovascular complications after myocardial infarction: final report of the Lyon Diet Heart Study," *Circulation* (1999) 99:779–85.
62. A. Leaf, "Dietary prevention of coronary heart disease: the Lyon Diet Heart Study," *Circulation* (1999) 99:733–35.
63. H.A. Diehl, "Coronary risk reduction through intensive community-based lifestyle intervention: the Coronary Health Improvement Project (CHIP) experience," *Am J Cardiol* (1998) 82(10B):83T–87T.
64. S.G. Aldana, R.L. Greenlaw, H.A. Diehl, et al., "Effects of an intensive diet and physical activity modification program on the health risks of adults," *J Am Diet Assoc* (2005) 105(3):371–81.

65. D. Ornish, S.E. Brown, L.W. Schenwitz, et al., "Can lifestyle changes reverse coronary heart disease?," *Lancet* (1990) 336:129–33; and D. Ornish, L.W. Schenwitz, J.H. Billings, et al., "Intensive lifestyle changes for reversal of coronary heart disease," *JAMA* (1998) 280:2001–07.
66. J. Koertge, G. Weidner, M. Elliott-Eller, et al., "Improvement in medical risk factors and quality of life in women and men with coronary artery disease in the Multicenter Lifestyle Demonstration Project," *Am J Cardiol* (2003) 91:1316–22.
67. D. Ornish, G. Weidner, W.R. Fair, et al., "Intensive lifestyle changes may affect the progression of prostate cancer," *J Urol* (2005) 174:1065–69.
68. C.B. Esselstyn Jr., "Updating a 12-year experience with arrest and reversal therapy for coronary heart disease (an overdue requiem for palliative cardiology)," *Am J Cardiol* (1999) 84(3):339–41; C.B. Esselstyn Jr., "Resolving the coronary artery disease epidemic through plant-based nutrition," *Prev Cardiol* (2001) 4:171–77; and "Becoming heart attack proof" (VegSource Interactive, Inc., 2003), [www.vegsource.com/esselstyn/index.htm](http://www.vegsource.com/esselstyn/index.htm).
69. Institute of Medicine (IOM), *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (Macronutrients)* (Washington, DC: National Academies Press, 2002), pp. 297–302, 777–87; and Ornish et al., "Intensive lifestyle changes for reversal."
70. R.J. Barnard, T. Jung, and S.B. Inkeles, "Diet and exercise in the treatment of NIDDM: the need for early emphasis," *Diabetes Care* (1994) 17:1469–72.
71. M.G. Crane and C. Sample, "Regression of diabetic neuropathy with total vegetarian (vegan) diet," *J Nutr Med* (1994) 4:431–39.
72. American Cancer Society (ACS), "The complete guide – nutrition and physical activity," [www.cancer.org/docroot/PED/content/PED\\_3\\_2X\\_Diet\\_and\\_Activity\\_Factors\\_That\\_Affect\\_Risks.asp?sitearea=PED](http://www.cancer.org/docroot/PED/content/PED_3_2X_Diet_and_Activity_Factors_That_Affect_Risks.asp?sitearea=PED); DHHS/USDA, *Dietary Guidelines for Americans*; and World Health Organization/Food and Agriculture Organization (WHO/FAO), *Diet, Nutrition and the Prevention of Chronic Diseases*, WHO Technical Report Series 916 (Geneva, 2003).
73. H.C. Hung, K.J. Joshipura, R. Jiang, et al., "Fruit and vegetable intake and risk of major chronic disease," *J Natl Cancer Inst* (2004) 96:1577–84; S. Liu, I.M. Lee, U. Ajani, et al., "Intake of vegetables rich in carotenoids and risk of coronary heart disease in men: the Physicians' Health Study," *Int J Epidemiol* (2001) 30:130–35; and L.A. Bazzano, J. He, L.G. Ogden, et al., "Fruit and vegetable intake and risk of cardiovascular disease in US adults: the first National Health and Nutrition Examination Survey Epidemiologic Follow-up Study," *Am J Clin Nutr* (2002) 76:93–99.
74. K.J. Joshipura, F.B. Hu, J.E. Manson, et al., "The effect of fruit and vegetable intake on risk for coronary heart disease," *Ann Intern Med* (2001) 134:1106–14; and S. Liu, J.E. Manson, I.M. Lee, et al., "Fruit and vegetable intake and risk of cardiovascular disease: the Women's Health Study," *Am J Clin Nutr* (2000) 72:922–28.
75. T.H. Rissanen, S. Voutilainen, J.K. Virtanen, et al., "Low intake of fruits, berries and vegetables is associated with excess mortality in men: the Kuopio Ischaemic Heart Disease Risk Factor (KIHD) Study," *J Nutr* (2003) 133:199–204.
76. Bazzano et al., "Fruit and vegetable intake."
77. P. Van't Veer, M.C. Jansen, M. Klerk, et al., "Fruits and vegetables in the prevention of cancer and cardiovascular disease," *Public Health Nutr* (2000) 3:103–07.
78. L.M. Steffen, C.H. Kroenke, X. Yu, et al., "Associations of plant food dairy product, and meat intakes with 15-y incidence of elevated blood pressure in young black and white adults: the Coronary Artery Risk Development in Young Adults (CARDIA) Study," *Am J Clin Nutr* (2005) 82:1169–77; and L. Dauchet, P. Amouyel, and J. Dallongeville, "Fruit and vegetable consumption and risk of stroke: a meta-analysis of cohort studies," *Neurology* (2005) 65:1193–97.